1966

# What Is Good Agricultural Limestone?

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# AGRONOMY NOTES

SOILS • CROPS

Prepared by Department of Agronomy, University of Kentucky Cooperative Extension Service


No. 40

## WHAT IS GOOD AGRICULTURAL LIMESTONE?

By George D. Corder

During the 10-year period, 1955-64, Kentucky farmers used more than 14 million tons of agricultural limestone. The investment in the limestone plus hauling and spreading was in the neighborhood of $45 million. In 1964 alone, Kentucky farmers invested about $7 million in about 2 million tons of limestone.

A summary of the 52,000 soil samples tested in county and state laboratories in 1964 indicates that 58 percent of the land tested needed limestone applications for any field crop. If all the land tested had been for alfalfa, 75 percent would have needed limestone.

A summary of the soil tests made in 1955 or any succeeding year shows about the same thing. This means, in general, that Kentucky farmers did not reduce soil acidity even though they used 14 million tons of limestone.

Research at the Agricultural Experiment Stations in Kentucky and other states has shown that fineness of grind is one of the factors that determines the effectiveness of agricultural limestone. This is illustrated in the following table:

TABLE 1 - EFFECTIVENESS OF LIMESTONE DEPENDS ON PARTICLE SIZE

| Particle Size | Soluble in 3 Years |
|---|---|
| Larger than 4 mesh (about 1/4 inch) | 0% |
| Smaller than 4 mesh but larger than 8 mesh | 10% |
| Smaller than 8 mesh but larger than 20 mesh | 30% |
| Smaller than 20 mesh but larger than 60 mesh | 60% |
| Smaller than 60 mesh (dust) | 100% |

In general, agricultural limestone used on Kentucky farms has not had enough of the 60-mesh material to give the results that farmers expected.

The reduction of soil acidity that limestone will give is in direct proportion to the total surface exposed to the soil. The following table gives the surface exposed by particles of different sizes:

| Particle Size | No. of Particles Per Ounce | Square Inches of Exposed Surface Per Ounce |
|---|---|---|
| Larger than 10 mesh | 1,200 | 18. |
| 28-40 mesh | 175,000 | 200. |
| 60-100 mesh | 2,560,000 | 505. |
| Smaller than 100 mesh | 77,000,000 | 1520. |



(To simplify information in this publication, trade names of some products are used. No endorsement is intended, nor is criticism implied of similar products not named.)


Cooperative Extension Work in Agriculture and Home Economics: College of Agriculture and Home Economics, University of Kentucky, Lexington, and the United States Department of Agriculture, cooperating. William A. Seay, Director. Issued in furtherance of the Acts of May 8 and June 30, 1914.

The cash returns to the farmer who uses limestone is dependent upon the fineness of grind. The following table gives the results obtained at Ohio State University on corn, oats, wheat, and clover rotations:

| Particle Size | Amount Used | Returns Per Acre Per Rotation |
|---|---|---|
| 28% smaller than 60 mesh | 4.0 tons | $23.60 |
| 55% smaller than 60 mesh | 2.0 tons | 24.16 |
| Hydrated lime | 1.5 tons | 28.52 |

Note that it took four tons of the 28 percent material to equal two tons of the 55 percent material and that two tons of the latter were almost as effective as 1.5 tons of hydrated lime.

Purdue University did research on the substitution rates of different types of limestone and what a farmer could afford to pay for each type. The relative quarry values in the following table are based on the returns a farmer can expect from each type of limestone if the 40-50 grade is taken as the reference point and if $1.50 per ton is charged at the quarry and $1.50 is charged for hauling and spreading.

| Fineness of Limestone Percent Smaller Than 60 Mesh | Amount of Limestone For Equal Returns | Quarry Value Per Ton |
|---|---|---|
| 40-50 | 1.9 tons | $1.50 |
| 30-40 | 2.2 tons | 1.09 |
| 20-30 | 3.0 tons | 0.40 |

When limestone is ground so coarsely that less than 40 percent will pass through a 60-mesh screen, the price farmers can afford to pay declines rapidly. However, the costs at the quarry for different types of limestone do not vary this much. A more finely ground limestone than that used in Kentucky has been used in Tennessee for several years. Yet, a report from that state shows that the average cost of limestone in 1964 was 10 cents per ton less than in Kentucky.

Agricultural limestone ground fine enough that at least 40 percent will pass through a 60-mesh screen has been recommended by the Univ. of Ky. Agricultural Experiment Station for several years.

More accurate recommendations of the amount of lime needed for a particular soil can be made if the effectiveness of the limestone to be used is known. During the past year or two, some quarry operators have installed equipment designed to grind limestone to meet the recommendations of the Univ. of Ky. Agri. Exp. Station. In 1964, 33 percent of the limestone samples collected by ASC met this recommendation. In the last six months of 1965, about 40 percent of the samples met the recommendation. Thus, some improvement in the quality of available limestone has taken place, and, based on conversations with quarry operators, we are certain that further improvement has been made since January 1.

At the present time, however, some farmers will not be able to obtain lime meeting the Univ. of Ky. Agri. Exp. Station recommendations. Thus, if a farmer buys limestone that is more coarsely ground than is recommended, he should increase the rate to compensate for the lower quality.

The following table shows the approximate equivalent amounts of limestone according to fineness of grind:

| Grade | Percent Smaller than 60 mesh | Amount to Apply |
|---|---|---|
| Fine (Standard) | 40-49 | 2,000 pounds |
| Medium | 30-39 | 2,500 pounds |
| Coarse | 20-29 | 3,000 pounds |
| Extra fine | 50 or more | 1,500 pounds |

Information on the quality of limestone from local quarries should be available at the local ASC office.



1M-4-66

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Correction to Agronomy Notes:

"WHAT IS GOOD AGRICULTURAL LIMESTONE?"

A gross conversion error was made in preparing the table at the bottom of page one in this recent article. The table should read:

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|---|---|---|
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| 28-40 mesh | 175,000 | 200 |
| 60-100 mesh | 2,560,000 | 505 |
| Smaller than 100 mesh | 77,000,000 | 1520 |

These figures were obtained from "The Efficiency of Various Particle-size Fractions of Limestone" by H. L. Motto and S. W. Melsted in Soil Science Society of American Proceedings 60:488-490; 1960. In the original article, values were given in metric units. The error was made in changing to English units.

H. F. Massey

1050-4-66